GUIDED MISSILE AIM-9C, SIDEWINDER 1C-SAR
(Formerly Guided Missile Mk 30 Mod 0)

DESCRIPTION, OPERATION, AND HANDLING

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FOREWORD

NAVORD OP 3351 describes the Guided Missile AIM-9C, Sidewinder 1C-SAR, lists shipping containers, assembly tools, and handling and testing equipment, and gives assembly procedures.

The handling and operating instructions for the AIM-9D missile are given in OP 3352. OP 3353 is the pilot's handbook for AIM-9C and AIM-9D missiles.

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SAFETY SUMMARY

GENERAL PRECAUTIONS

In handling, assembly, and stowage of the AIM-9C missile, the precautions given in OP 5, Ammunition Ashore, dated 9 August 1957, and in NAVSO P-2455, Department of the Navy Safety Precautions for Shore Activities, dated April 1965, shall be observed. Certain other general precautions are given below:

1. Make sure that the firing system of the aircraft cannot be energized during launcher loading and unloading operations.

2. Do not stand directly in front of or behind the missile unless absolutely necessary during handling operations. Stand clear of the launcher at all times after the missile is loaded on the launcher.

3. Do not smoke within 200 feet of ordnance.

MISSILE COMPONENT PRECAUTIONS

The safety-arming device (S-A), warhead, and motor of the AIM-9C are potentially dangerous ordnance material and shall be treated in accordance with existing regulations. Specific WARNINGS are repeated from the text for the protection of personnel.

WARNINGS

Do not apply excessive pressure to the motor case when securing the motor to the stanchions, as degradation of the bonded propellant may result. (Page 4-7)

Always assemble the target-detecting device (TDD) to the guidance and control group (GCG), and then assemble the S-A to the GCG-TDD combination. Never assemble a fuze as a single unit. (Page 5-1)

No electrical checks are to be made on the S-A by handling personnel. (Page 5-2)

The S-A contains a sensitive explosive and must be handled with care. DO NOT drop the S-A or attempt to assemble an S-A to a TDD if the S-A has been damaged, has been dropped, or is suspected of having been dropped. Such an S-A shall be repacked and instructions for its disposition requested from the Bureau of Naval Weapons. (Page 5-2)

As the S-A is hermetically sealed at the factory and all tests are made before shipment from the depot, no tests, adjustments, or checkout procedures shall be made by handling personnel, except visual inspection of the SAFE-ARMED indication in the window of the S-A. (Page 5-2)

Always grasp the S-A at the end close to the retainer ring. Keep handling of the S-A to a minimum. (Page 5-2)

DO NOT use an S-A if by visual inspection (1) it is found to be in the A (ARMED) position or (2) it cannot be determined to be in the S (SAFE) condition. (Page 5-2)

The S-A contains a sensitive explosive; therefore, when assembled to the GCG and TDD, the unit shall be handled with the same care given any item of explosive ordnance. (Page 5-5)

Do not alter or attempt to repair any part of the motor or igniter. Avoid jarring or dropping the motor. A cracked grain may cause motor blowup on firing. Do not use a motor that has been dropped or has a damaged (punctured or cracked) nozzle weather seal. Do not probe or punch weather seal with fingers or tools. Reject any motor that has been dropped or damaged, and dispose of in accordance with regulations. (Page 5-5)

The warhead is potentially dangerous ordnance material and should be handled in accordance with existing ordnance regulations for Class A explosives. Do not perform any alterations on the warhead or attempt to disassemble any of its parts. If a warhead is damaged, it shall be disposed of in accordance with local instructions. (Page 5-5)

Do not stand directly in front of or behind the missile during loading operations. Stand clear of the launcher at all times after the missile is loaded on the launcher. VERIFY the safe condition of the launcher and aircraft before loading the missile on the aircraft by checking that the detent wrench-safety pin is installed properly, that cockpit switches are OFF, that aircraft engines are OFF, that auxiliary power is NOT connected to the aircraft, and that the aircraft is grounded. (Page 5-10)

Do not stand directly in front of or behind the missile during unloading operations. (Page 5-11)

When the missile is removed from the launcher, DO NOT REMOVE the detent wrench-safety pin. (Page 5-11)

The following CAUTIONS are repeated from the text because if not strictly followed the effectiveness of the missile and equipment may be destroyed.

CAUTIONS

The AIM-9C umbilical connector is always live. If the trigger is squeezed, the gas-generator grain will ignite and the GCG will have to be rebuilt. (Page 2-4)

Do not remove a component from stowage or from its container until it is required in the assembly operation. (Page 5-1)

Never lift the GCG by the umbilical. Be careful that the ceramic radome does not rub against brass belt buckles of personnel when the GCG is lifted to waist height. (Page 5-1)

If soap or cleanser and water are required to clean the radome, DO NOT let water get on any other part of GCG. (Page 5-1)

Never drop hatch cover screws into the hatch. Never secure the cover of the crystal oscillator hatch with anything but the special hatch cover screws. Spare screws are found in the spare parts bag in the fin container. (Page 5-1)

Do not remove the protective tape from the windows of the IR TDD, and do not remove the red plastic cap from the electrical connector on either TDD. (Page 5-2)

Because the plug body is made of cast aluminum, use caution while securing plug retainer screws. The tabs can easily be broken by too much pressure. (Page 5-2)

When the seeker is not operating, the radome should be covered by a protective RF-shielding cover to prevent receiver damage by radars operating in the vicinity. (Page 5-5)

Failure to assemble mating parts properly can result in rocket motor failure and missile breakup near the firing aircraft, which may cause missile components to strike the aircraft. (Page 5-6)

Avoid striking or damaging the rollerons in any way. (Page 5-6)

In the missiles, use only crystal oscillator assemblies marked with the decal "SUITABLE FOR AIM-9C MISSILE AIR FIRING." Any crystal oscillator assembly (with or without this decal) can be used in aircraft radars. (Page 5-6)

Handle coolant tanks with care at all times. It is essential that the seal valve at the forward end of the coolant tank be kept free of sand, dust, oil, grease, water, and other contaminants. NEVER APPLY ANY OIL, GREASE, OR OTHER LUBRICANTS TO THE LARGE THREADS ON THE SEAL VALVE. (Page 5-6)

Never leave the launcher unattended with the aft fairing open. (Page 5-10)

The forward-receptacle dust cap must be kept in place on the launcher power-supply receptacle at all times when a missile is not installed on the launcher. The upper-receptacle dust cap must be on the aircraft-pylon receptacle on the launcher top side WHENEVER the launcher is removed from the aircraft. (Page 5-10)

The AN/ASM-20 test set is susceptible to high level electromagnetic radiation. Under such an environment, test readings are unreliable. (Modifications to eliminate this problem are being developed.) (Page 6-1)

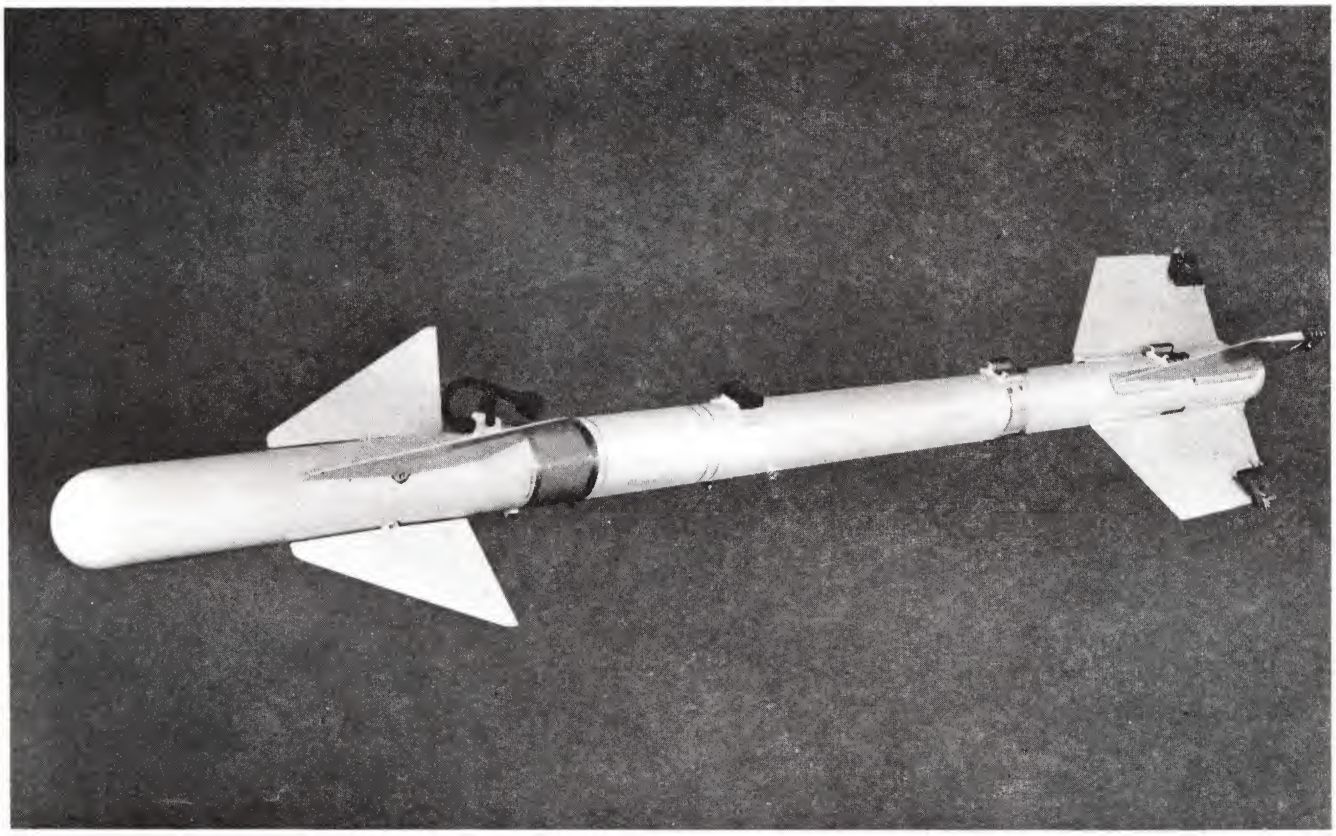


Figure 1-1. AIM-9C (Sidewinder 1C Air Intercept Missile).

Chapter 1
INTRODUCTION

1-1 GUIDED MISSILE AIM-9C, SIDEWINDER 1C-SAR

The Sidewinder 1C missile system consists of the semiactive radar-guided AIM-9C (formerly Guided Missile Mk 30 Mod 0) and the infrared-guided AIM-9D (formerly Guided Missile Mk 29 Mod 2). The AIM-9C and AIM-9D missiles are identical except for the guidance and control groups; both missiles use the same warhead, motor, and fuzes. The system was designed to offer the following increased capabilities over those of the AIM-9B, Sidewinder 1A:

a. Foul-weather capability
b. Increased range and altitude
c. Higher kill probability at high altitudes
d. Less susceptibility to countermeasures
e. Superior capability to accept rigorous operational environment

These increased capabilities are realized in missiles that are much more complex than the AIM-9B; however, the design concepts of the original Sidewinders of reliability, ease of handling, and no maintenance are followed.

The AIM-9C is discussed in this ordnance pamphlet; the AIM-9D is covered in another publication, OP 3352, listed as item 1 of paragraph 1-12.

The radar-guided AIM-9C, shown in figure 1-1, gives the AIM-9 series both all-weather and nose-on capabilities. The missile has 38 seconds of guidance time, and it functions in two modes -- semiactive and passive. In the semiactive mode, the missile homes on the pulsed radar energy emitted by the launching aircraft and reflected off the target into the radar seeker. In the passive mode, the missile homes on the target radar jammer and is, in effect, a built-in counter-countermeasure.

The Mk 48 continuous-rod warhead explodes into a continuous ring of steel. It is initiated by either a contact fuze or an influence fuze. It is insensitive to high temperatures, and lethality is not impaired at high altitudes.

The Mk 36 motor has the same diameter and is 5 inches shorter than the Mk 17 motor used with the Sidewinder 1A, but has nearly twice the total impulse; it gives greater range and can withstand high temperatures. A nonpropulsive head closure on the motor blows out if the motor is accidentally ignited without the warhead, making the motor nonpropulsive. The motor also has a radio interference filter (RIF) for increased safety in the presence of high-energy radiation.

Fuze (RF) Mk 322 is recommended for use in the AIM-9C. However, Fuze (IR) Mk 323 is physically interchangeable with the Mk 322 fuze. The Mk 322 fuze is made up of the Mk 15 radio frequency (RF) target-detecting device (TDD) and the Mk 13 safety-arming device (S-A), and the Mk 323 fuze is made up of the Mk 24 infrared (IR) TDD and the Mk 13 S-A. Both fuzes have influence and contact capability. In the contact fuze system, the firing voltage is developed by lead zirconate titanate crystals located in the rocker arm of the guidance fin. The crystal and its associated circuitry provide the energy to fire the detonators of the S-A.

The surfaces of the fins and wings of the missile are enlarged over those of the AIM-9B to give it additional maneuverability. Rollerons on each wing provide pitch-and-yaw rate damping and reduce roll rate.

1-2 PERFORMANCE

The AIM-9C is optimized for forward-hemisphere attacks, but is also effective in rear-hemisphere attacks. It is effective when firing into the sun or moon, in clouds, rain, and haze, and against a radar jammer. Aerodynamic launch envelopes are given in item 2, paragraph 1-12.

1-3 MISSILE COMPONENTS

The major components of the AIM-9C are the following:

Guidance and Control Group Mk 12 Mod 2

Fuze (RF) Mk 322 Mod 0
Target-Detecting Device Mk 15 Mod 0
Safety-Arming Device Mk 13 Mod 0

Fuze (IR) Mk 323 Mod 0
Target-Detecting Device Mk 24 Mod 0
Safety-Arming Device Mk 13 Mod 0

Warhead Mk 48 Mod 0
Motor Mk 36
Wing Assembly Mk 1 Mod 0

1-4 TRAINING COMPONENTS

Dummy Missile Types I and III are used in training.

1-5 CONTAINERS FOR MISSILE COMPONENTS

Mk 270 Mod 1 GCG container (two units)
Mk 314 Mod 0 fin container (12 units)
Mk 129 Mod 0 container for Mks 15 and 24 TDDs (four units)
Mk 127 Mod 0 inner container for S-A devices (four units)
Mk 2 Mod 0 outer container for S-A devices (20 units)
Mk 386 Mod 0 warhead container (two units)
Mk 287 Mod 0 rocket motor container (one unit)
Mk 418 Mod 0 wing assembly container (eight units)

1-6 ASSEMBLY EQUIPMENT AND TOOLS

A Sidewinder assembly stand and the following tools are required:

Special screwdriver
Bottle wrench (for coolant tank)
Socket-head Allen wrench, 5/32-in.
Spanner tube wrench (for S-A)
Torque wrench, 100 pound-inches
T-handle wrench

1-7 HANDLING EQUIPMENT

Handling equipment includes the Aero 12B and 21A bomb skids; the Aero 8C-1, 9B, 39B, and 84A adapters; and the Aero 30A-1 vibration isolators. A collapsible assembly tray is supplied for the GCG.

1-8 TEST SETS

The Mk 401 Mod 1 test set is used to test the Mk 12 GCG. The AN/ASM-20 guided missile launcher test set is used to test the LAU-7/A launcher and aircraft circuits.

1-9 LAUNCHER

The LAU-7/A launcher provides a self-contained launching system for the AIM-9C/D and the AIM-9A/B (with an umbilical adapter). The launcher may be attached to the Aero 3A pylon or to any pylon with the same attachment pattern. The launcher secures the missile in captive flight and releases it when the missile is fired by the pilot. A solenoid-operated detent lock prevents accidental missile release during arrested landings. A safety pin prevents accidental ground firing.

1-10 ANCILLARY EQUIPMENT

Ancillary equipment for the protection and safety of the components of the missiles includes the following:

Protective radome cover
(for RF shielding with attached gas-vent stopper)
Fuze cover
Rolleron caps
Plate to cover firing pins
Umbilical shorting plug

1-11 AIRCRAFT

The F-8D/E will carry the AIM-9C.

1-12 REFERENCED DOCUMENTS

1. Bureau of Naval Weapons. AIM-9D (Sidewinder 1C) Guided Missile; Description, Operation, and Handling (U), 1 December 1964. NAVWEPS OP 3352, CONFIDENTIAL.

2. U.S. Naval Ordnance Test Station. AIM-9C Aerodynamic Launch Envelopes (U), by B. A. Fouse. China Lake, Calif., NOTS, to be published later. NAVWEPS Report 8486, NOTS TP 3453, CONFIDENTIAL.

3. Bureau of Naval Weapons. Pilot's Handbook for Sidewinder 1C (AIM-9C and AIM-9D) Air-to-Air Guided Missiles (U), 1 December 1964. NAVWEPS OP 3353, CONFIDENTIAL.

4. Bureau of Naval Weapons. Guided Missile Launcher LAU-7/A, Handbook of Operation and Maintenance Procedures, NAVWEPS 11-75A-26; Guided Missile Launcher LAU-7/A, Handbook of Overhaul Instructions, NAVWEPS 11-75A-27; and Guided Missile Launcher LAU-7/A Illustrated Parts Breakdown. NAVWEPS 11-75A-28 (Latest Revisions). (All CONFIDENTIAL.)

5. U.S. Naval Ordnance Test Station. Test Set Mark 401 Mod 1 for Testing Guidance-Control Group Mk 12 (AIM-9C, Sidewinder 1C Guided Missile), Operations and Maintenance Instructions with Replaceable Electrical Parts List and Circuit Diagrams, China Lake, Calif., NOTS, November 1964. NOTS TP 3482, CONFIDENTIAL.

6. Bureau of Naval Weapons. Guided Missile Launcher Test Set AN/ASM-20, Operating and Maintenance Instructions, NAVWEPS 16-30ASM-20-1 (U) (Latest Revision).

7. Bureau of Naval Weapons. General HERO Restrictions for Ordnance (U), NAVWEPS 16-1-529 (Latest Revision).

Chapter 2
PHYSICAL DESCRIPTION

The AIM-9C, figure 2-1, is composed of four major sections: GCG, fuze (TDD and S-A), warhead, and motor. The complete missile is 119 inches long, is 5.0 inches in diameter, and weighs about 210 pounds.

2-1 GUIDANCE AND CONTROL GROUP

The semiactive radar Mk 12 Mod 2 GCG, shown in figure 2-2, consists of the radome, antenna, gyro precession assembly, and electronic circuits. The hemispherical radome is made of thermally and mechanically shock-resistant ceramic material that is able to withstand high in-flight temperatures and rain erosion. The skin of the GCG is aluminum. The GCG is 29.6 inches long, is 5.0 inches in diameter, and weighs about 55 pounds. With fins attached, the section has an over-all span of 20 inches and weighs about 60 pounds. The fins are larger than those on the AIM-9D.

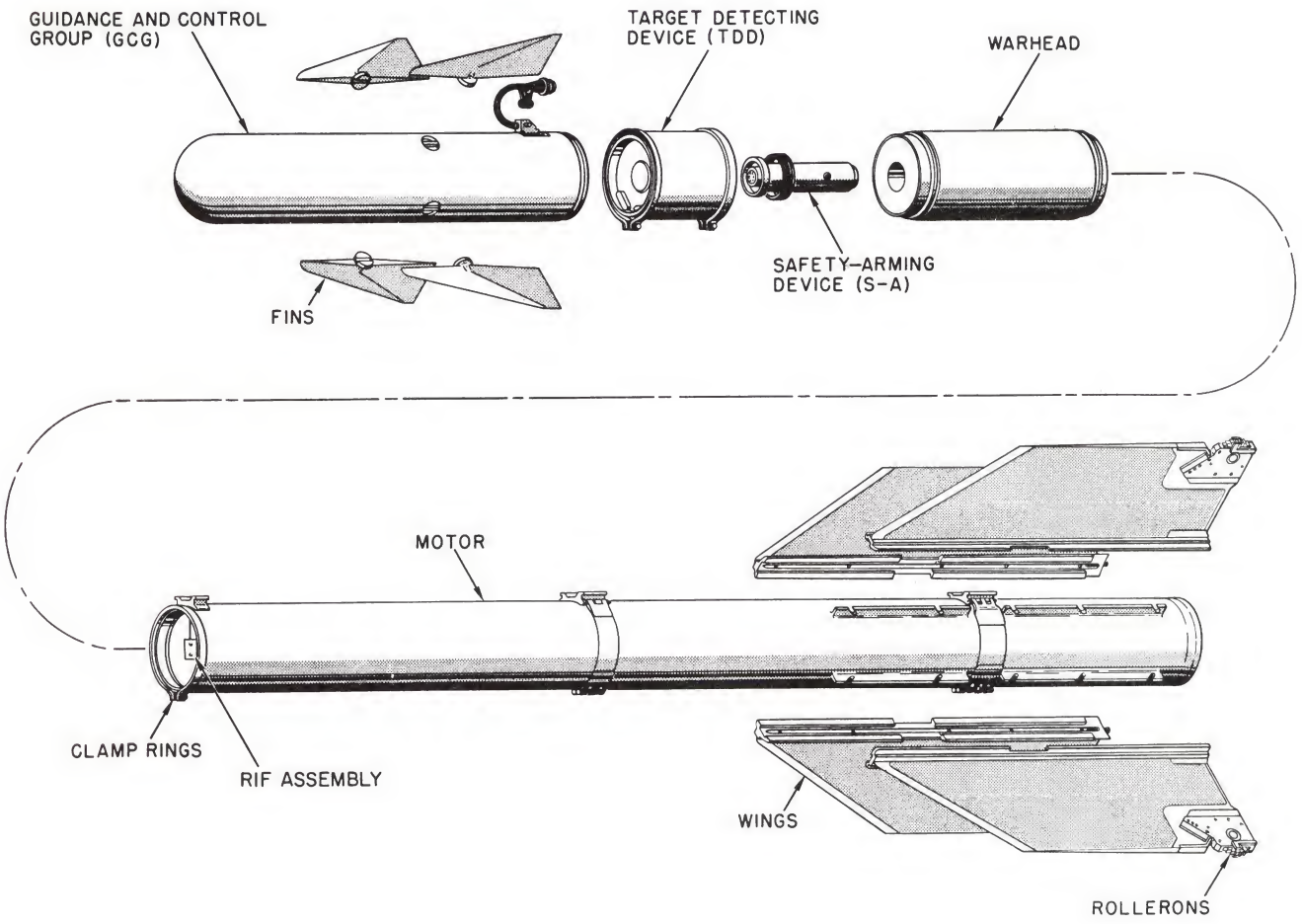


Figure 2-1. Exploded View of AIM-9C.

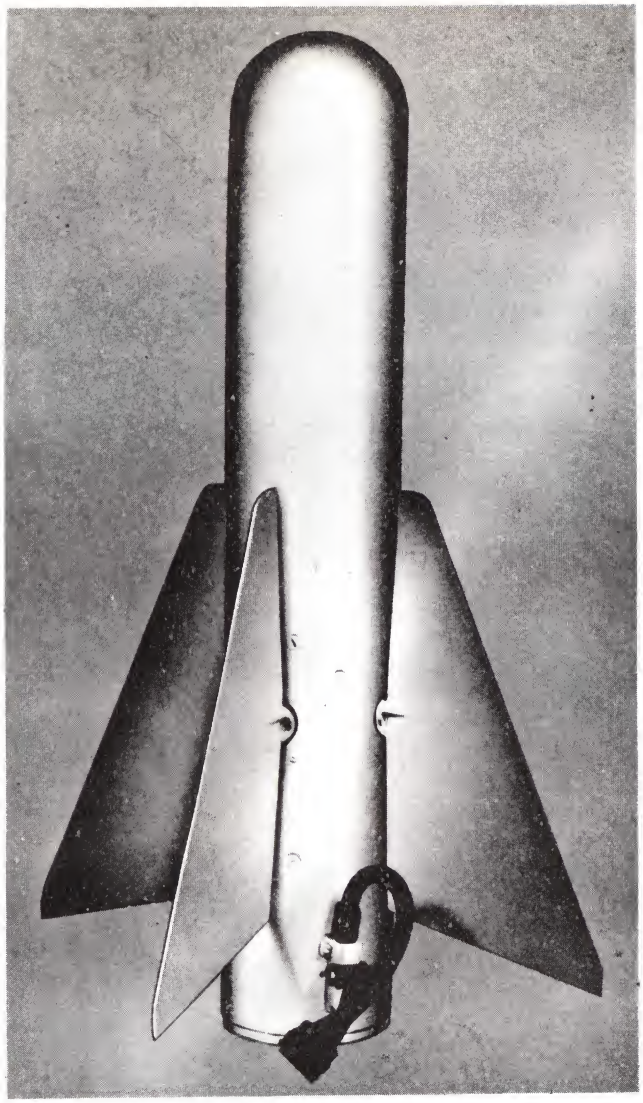


Figure 2-2. Mk 12 Mod 2 Guidance and Control Group.

2-2 FUZES

The Mk 322 Mod 0 radio frequency (RF) fuze is recommended for use in the AIM-9C; however, both the Mk 322 and the Mk 323 Mod 0 infrared (IR) fuze are made up of a target-detecting device (TDD) and a Mk 13 safety-arming (S-A) device. The RF fuze uses the Mk 15 RF TDD and the IR fuze uses the Mk 24 IR TDD. The fuze components are shown in figure 2-3. The fuze is located at the after end of the GCG. The S-A, which is inserted into the TDD only after it is attached to a GCG, fits into the recess at the forward end of the warhead. The TDD has clamp rings at each end for clamping it to the GCG and to the warhead.

Major internal parts of the Mk 15 TDD are

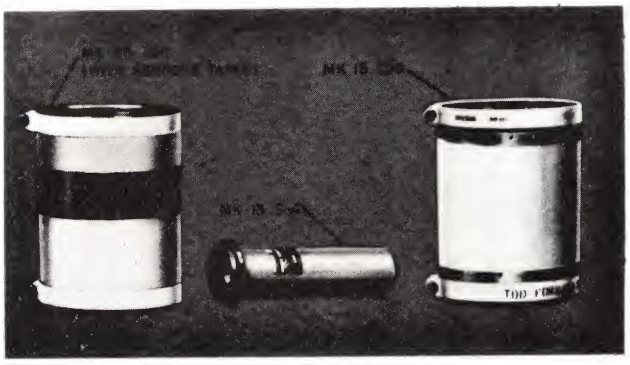


Figure 2-3. Fuze Components.

(1) the Thermal Battery Mk 70 Mod 0, (2) an RF oscillator assembly, and (3) an amplifier assembly that includes the TDD firing circuits.

Major internal parts of the Mk 24 TDD are (1) the Thermal Battery Mk 70 Mod 0, (2) an optical detector assembly, and (3) an amplifier assembly that includes the TDD firing circuits.

Major internal parts of the Mk 13 S-A are (1) an interrupted explosive train that contains 1.778 grams of high explosive, (2) a distance-measuring mechanism, and (3) associated electrical switches and circuitry. The Mk 13 S-A has a window for viewing the SAFE-ARMED indicator.

The physical dimensions of the fuze components are as follows:

	Length (in.)	Diameter (in.)	Weight (lb)
TDD Mk 24	6.75	5.0	8.5
TDD Mk 15	6.75	5.0	9.5 (approx)
S-A Mk 13	7.10	1.5	1.4

2-3 WARHEAD

The Mk 48 continuous-rod warhead is located between the fuze and the motor, and is recessed to accept the S-A of the fuze. The Mk 48 Mod 0 warhead, figure 2-4, is 13-1/2 inches long, is 5 inches in diameter, and weighs about 25 pounds. An integral booster is located in the closure assembly in the center of the explosive charge. The following information is stenciled on the loaded warhead:

BUWEPS (drawing number)
EXPLOSIVE (type)
EXPLOSIVE WT. (lbs)
TOTAL WT. (lbs)

Figure 2-4. Warhead Mk 48 Mod 0.

LOADING ACTIVITY _____ LOT NO. _____
DATE OF LOADING (month and year)_____

2-4 MOTOR

The Mk 36 rocket motor, figure 2-5, is about 70 inches long, is 5 inches in diameter, and weighs about 99 pounds. With wings attached, the wing span is about 25 inches and the weight is increased to about 123 pounds. The major components of the motor are the motor tube, propellant grain, igniter, and nozzle.

The 0.060-inch-thick motor tube is made of stainless steel by an extrusion process, so there are no seams.

The propellant is cast into the motor tube and case-bonded to the motor tube wall. The propellant has a brittle point of -115° F and an autoignition point of 498° F.

The igniter has a 75-gram main charge and a 1-gram booster charge that is initiated by the Mk 5 squib. The hot gases and particles exhausted through holes in the igniter tube cause the propellant to ignite. The igniter is held in place by a nonpropulsive head closure that will blow out if the motor is ignited when the warhead is not in place.

The nozzle consists of a steel backup ring with a phenolic-asbestos expansion cone molded to it. A weather seal between the graphite throat and the expansion cone keeps moisture out of the motor.

2-4.1 MOTOR IDENTIFICATION. On the left side at the forward end of the motor is a decal containing the following information:

ROCKET MOTOR MK 36 MOD _____
PART NO. _____ SERIAL NO. _____
STORAGE TEMP. RANGE -65° TO +165°F
OPERATING TEMP. RANGE -65° TO +165°F
DATE OF MFR. _____ LOADED WT. ____ LBS
CONTRACT NO. _____
GOVERNMENT INSP. _____ MFR. INSP. _____

The motor is also stenciled "WARNING DO NOT ROLL, TUMBLE, OR DROP."

Special motor designations may, from time

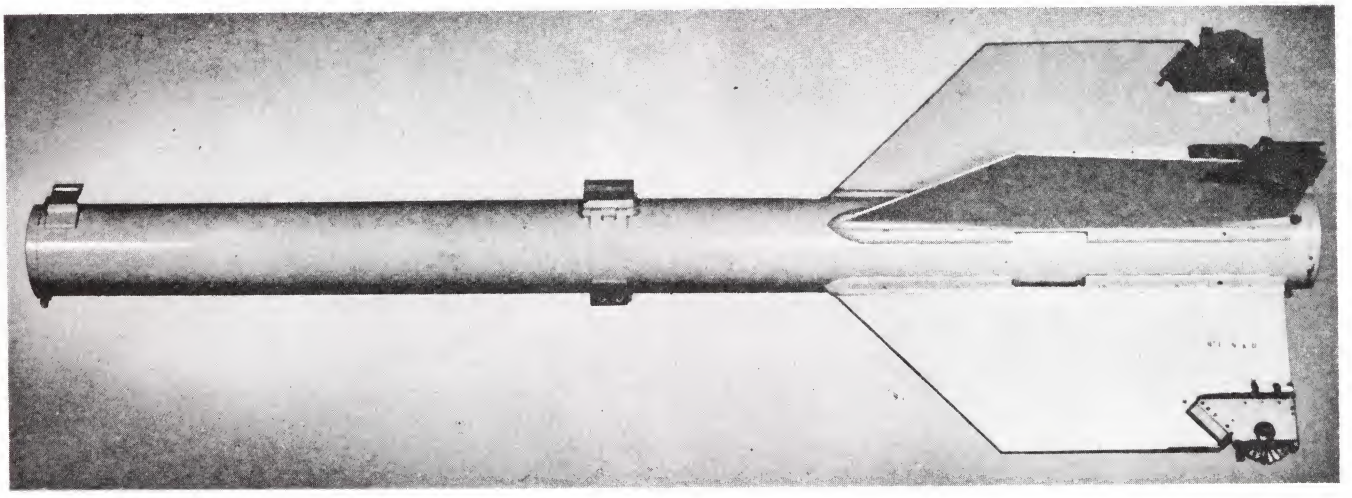


Figure 2-5. Motor Mk 36.

to time, appear on the left side, center, of the motor. These markings assign that particular motor to specific test or evaluation use. Rocket motors bearing these special designations on the left side, center, are to be used as designated only, unless otherwise directed by the Bureau of Naval Weapons.

2-4.2 OPERATING CHARACTERISTICS. Operating characteristics of the motor are as follows:

Aerodynamic heat at Mach 1.7 (130°F)	Indefinite
Operating temperature, °F	-65 to 165
Storage temperature, °F	-65 to 165

2-4.3 HAZARDS OF ELECTROMAGNETIC RADIATION TO ORDNANCE (HERO). The Mk 36 motor contains a radio interference filter that protects it from being accidentally ignited by RF energy. The missile may be operated under the general HERO restrictions for all ordnance given in NAVWEPS 16-1-259 (Latest Revision), item 7 of paragraph 1-12.

2-4.4 WING ASSEMBLY. Four wings are attached to the aft end of the motor (see figure 2-5). Each wing has a rolleron that is protected by a plastic cap. The caps are removed just before aircraft takeoff.

2-5 AIRCRAFT CONTROLS AND RADAR

The radar must be compatible with the AIM-9C. There are four different crystal oscillators coded with colored numbers. The oscillator in a missile must match the oscillator in the aircraft radar synchronizer. The radar must track the target while the missile is locked on and during the entire flight of the missile.

Check the aircraft handbook for the particular switch arrangement of the aircraft being used. The pilot's handbook, listed as item 3, paragraph 1-12, gives the firing procedure in more detail.

2-6 LAU-7/A LAUNCHER

The LAU-7/A launcher, figure 2-6, consists of a housing assembly, umbilical-hook support assembly, gas system, mechanism assembly, power supply, electrical system, and forward and after fairings. A full description of this launcher is given in the handbook listed as item 4, paragraph 1-12.

A gas system provides coolant gas for the infrared-guided AIM-9D. A source of coolant gas is not required with the AIM-9C; however, a gas bottle is kept in every launcher station to keep the threads clean. The 1/4-cubic-foot steel coolant tank (bottle) is located in the after section of the launcher housing assembly.

The physical dimensions of the LAU-7/A launcher are as follows:

Over-all length, in.	111
Height, in.	5-1/2
Width, in.	4
Launcher weight (including power supply and empty gas bottle), lb.	83
Distance between mounting bolts, in.	30 ± 0.005
Empty coolant-tank weight, lb.	11

2-7 DUMMY MISSILES

Two types of dummy missiles are used as training components. The type numbers are stenciled on the various missile components.

2-7.1 TYPE I. This missile has all dummy components. It is used in the evaluation of aircraft performance, aircraft-missile compatibility, and missile structure, and also is used in handling practice.

2-7.2 TYPE III. This missile has a live GCG so that the pilot can listen to the missile signal on captive flights. The remainder of this missile consists of dummy components. It is used in pilot training and in determining acquisition-system compatibility of the aircraft and missile.

CAUTION: The AIM-9C umbilical is always live. If the trigger is squeezed, the gas-generator grain will ignite and the GCG will have to be rebuilt.

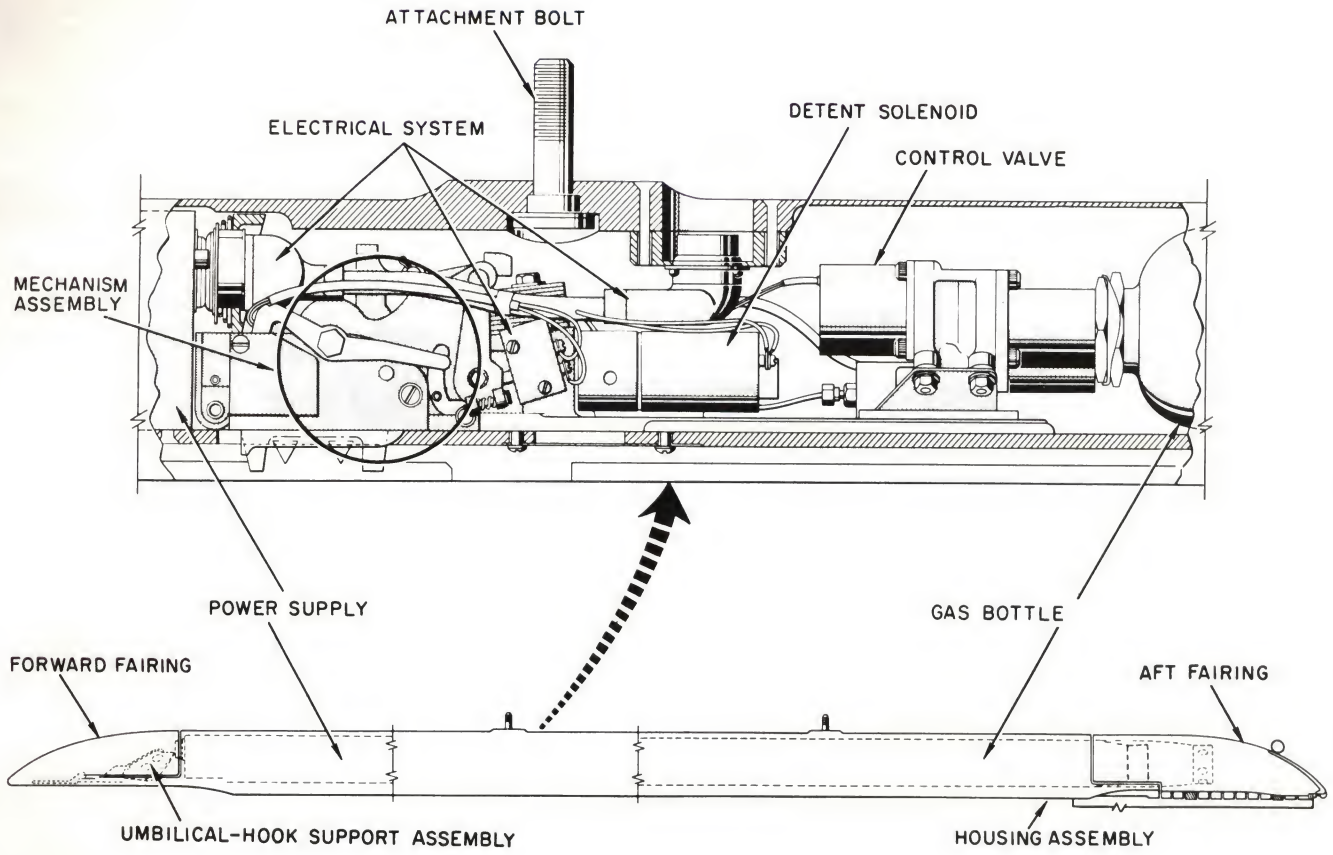


Figure 2-6. LAU-7/A Launcher.

Chapter 3
FUNCTIONAL DESCRIPTION

3-1 AIM-9C

The AIM-9C must be used on aircraft with an X-band radar capable of both search and track modes. The radar is modified by the addition of a small, transistorized synchronizer box (5 by 5 by 4 inches). A target is designated, in range, to the missile, and the pilot hears a tone in the earphones when the missile is range-tracking the target. If the missile is within the firing envelope as determined by the missile computer, the missile can be fired. After launching, the missile continues to track the target in range. If the lead launch computer is used, the seeker antenna is slaved to the AI radar after AI radar lock-on. Otherwise, the seeker antenna is uncaged at launching, and receives and modulates the echo if tracking errors are present. The modulation information repositions the seeker antenna to follow the target, and controls the guidance fins so that the missile flies a collision course toward the target.

In the home-on-jamming mode, the guidance information is obtained directly from the jamming energy radiated from the target aircraft.

The missile radar receiver has to be tuned to the radar transmitter frequency. A HI-LO momentary contact switch, located on the armament control panel of the aircraft, controls the tuning of the missile. The tuning meter on the armament control panel indicates correct tuning.

3-2 MK 12 GUIDANCE AND CONTROL GROUP

To keep this manual unclassified and thus of maximum utility to assembly and handling personnel, it is necessary to omit most of the details of the signal processing in the GCG. Classified publications are available to authorized personnel who are interested in the theory of operation.

3-2.1 ANTENNA. The antenna for the AIM-9C is located inside the ceramic hemispherical radome. It collects the radar energy in the echo coming from the target and passes it on to the receiver. The antenna also processes this energy so as to indicate to the receiver whether the antenna is pointed directly at the target or is above or below or to the left or right of the target. This is necessary because the function of the receiver is to amplify greatly the echo signals and thus convert them to voltages that will drive the torquer motors so as to keep the antenna pointing directly at the target.

3-2.2 GYRO PRECESSION ASSEMBLY. The antenna is mounted on a gyro and is thus stabilized in inertial space and is not affected by pitch or yaw of the missile body.

The complete antenna, gyro, and gyro drive motor are suspended on an internal gimbal so that the line of sight of the antenna is space-stabilized against missile maneuver. Microwave energy is carried from the antenna feed by a flexible subminiature coaxial cable passing through the center of the gimbal, and terminates in a coax-to-waveguide transition, which in turn mates with the received input waveguide. Motor-drive voltages are carried by an ultraflexible ribbon-cable lead affixed to the back of the gyro stator.

Torques to drive the gyro antenna in tracking the target are supplied by the DC torque motors through push rods attached to the rear of the gyro stator with hinged joints so as not to interfere with the freedom of suspension of the unit.

3-2.3 RECEIVER. The incoming microwave signals, having been collected and processed by the antenna, are next carried to the receiver input waveguide. This incoming energy is mixed with the output of a klystron local oscillator that is tuned 30 mc below the signal frequency. The output of the mixer is the 30-mc difference between the frequency of the input signal and the local oscillator. This signal, which is identical to the input signal except for frequency, is amplified by the intermediate frequency (IF) amplifier and is peak-detected to produce video signals. These video signals are amplified further and are then ready to be used in the range-tracking circuits.

3-2.4 AUTOMATIC FREQUENCY CONTROL (AFC). The AFC system is used initially to

establish and thereafter to maintain the 30-mc difference between the receiver local oscillator and the incoming signals. The AFC is actuated by leakage from the aircraft radar transmitter. This system allows missile AFC tune-up on the ground or at any time in flight when the radar and missile are operating.

A frequency discriminator samples the frequency of the main-bang pulses passing through the IF amplifier. If this frequency differs from the desired 30 mc, a corrective signal is developed, which passes from the missile to the missile-tuning amplifier in the aircraft and then back into the missile to drive a small servo motor. The servo motor retunes the missile klystron to re-establish the main bang IF at 30 mc. If a gross initial tuning error exists (for example, when a new missile is placed on a particular aircraft), the pilot must manually tune the missile servo motor by means of the missile tuning switch in the cockpit. When the correct frequency is reached, the cockpit tuning meter sharply rises to maximum; the tuning switch may then be released, and the AFC makes the final corrections. The missile must always be tuned from the low end of its frequency band, stopping at the first meter maximum in order to achieve stable AFC operation.

3-2.5 RANGE TRACKING. To reduce the amount of noise that enters the missile steering circuits, it is necessary that the missile receiver function only during the time that the echo from the actual target is arriving at the antenna. This is accomplished by the range tracking circuitry. The range gate is a switch between the video amplifier output and the steering circuits. This switch is open most of the time, and closes for only a fraction of a microsecond to let the target signal through to the steering circuits. The range tracking circuitry also compares the time of the gate with the time of arrival of the target echo, and, for instance, if the gate is a little late, takes action to make the gate earlier the next time so that the range gate will track the target echo in range. The range tracking circuitry contains electronic integrators which remember the target range and velocity so that if the target were momentarily lost due to, say, a radar fade, the range gate would continue on at its last known velocity until the target reappeared. Before the missile is launched, the aircraft radar range gate pulse is fed through the synchronizer and launcher and into the missile. This gate pulse designates to the missile where to look in range, and the missile is thus locked on to the same target the aircraft radar is tracking.

3-2.6 AUTOMATIC GAIN CONTROL AND ANGLE TRACKING. The function of the range gating circuitry is to let only the true target echo signals into the missile steering circuitry. After these signals have been let in they must be further processed. As the missile closes on the target, the strength of the target echo builds up. If it were allowed to keep on building up as the missile approached the target, the signals in the video amplifiers would approach hundreds of volts, well beyond the capability of the circuitry. A feature called Automatic Gain Control (AGC) is incorporated into the missile to eliminate this problem. After the signal reaches a certain level (called AGC threshold), a voltage is fed back to the AGC terminal on the I. F. Amplifier which reduces its gain and keeps the average level of the video voltages the same value no matter how strong the target echos become. The angle tracking circuits convert the video voltages to D. C. voltages of a suitable amplitude to drive the gyro torquer motors and precess the gyro so as to keep the antenna pointing at the target.

3-2.7 CONTROL SERVO. The AIM-9C uses proportional navigation to predict the target intercept point and fly toward it. Proportional navigation requires that the turning rate of the missile be some multiple of the seeker sight-line rate.

The gyro-torque currents are fed through magnetic DC amplifiers to the pneumatic servo.

The output fin torque from the servo causes a missile turning rate proportional to the DC error signal, that is, to the gyro sight-line rate. The torque balance system in the pneumatic servo makes the missile turning rate for a given seeker sight-line rate independent of airspeed and altitude. The primary electrical power for the missile while in flight is obtained from a hot-gas turbo-generator.

3-2.8 AUTOPILOT. The radome of the AIM-9C introduces slight, but unavoidable, distortions in the apparent line of sight to the target. The radome is part of the airframe and thereby couples airframe pitch and yaw into the target line of sight. At high altitudes, the natural airframe damping provided by the wings of the missile is greatly reduced. The radome coupling may be phased to further reduce the airframe damping. Target angular scintillation noise will then excite the airframe into oscillation.

An autopilot is incorporated into the AIM-9C to stabilize the missile at high altitudes and in

the presence of target noise. Subminiature rate gyros measure airframe pitch-and-yaw rates, and the resulting electrical signals are summed with the guidance signals to drive the control surfaces to oppose the pitch-and-yaw oscillations and prevent the airframe from breaking into uncontrolled oscillation.

3-2.9 POWER SUPPLIES. Several of the receiver and range-tracking circuits in the AIM-9C are highly sensitive to power supply voltage transients. Therefore, the power supplies are closely regulated by high-gain transistorized DC amplifiers.

3-2.10 FIRING SEQUENCE. When the pilot depresses the firing trigger, the gas-generator grain in the control servo is ignited. The firing circuit in the launcher senses when the turbogenerator is producing enough power to operate the missile in flight. The firing signal is then fed to a high-speed explosive switch in the missile to effect changeover from standby to internal missile power. The firing signal also ignites the rocket motor, and the missile leaves the launcher.

3-3 FUZES

The primary function of the TDD of the fuze is to sense the target and cause warhead detonation at the point of maximum kill probability. When the missile passes within a predetermined distance of the target, the TDD sends a firing signal to the explosive train in the S-A, which causes initiation of the warhead booster and detonation of the warhead. In case of contact with the target, a signal from a piezoelectric crystal in the rocker arm of the servo initiates the explosive train in the S-A. A self-destruct function in the missile is activated 3 seconds after loss of signal or after loss of +28-volt power.

The TDD operates from the Mk 70 thermal battery and is completely independent of the power supply of the missile. Just before missile launch, an electrical pulse is supplied to the GCG from the launching aircraft through the umbilical connector. When the turboalternator of the GCG reaches operating condition, the firing relay in the power supply closes; this supplies firing current to the Mk 36 motor and the squib of the thermal battery in the TDD.

The S-A performs the dual functions of (1) preventing detonation of the missile warhead during assembly and handling, and (2) arming the warhead so that detonation can take place after the missile has traveled the specified distance. The S-A performs these functions by keeping the units of the explosive train, which it contains, in a misaligned condition until the missile has reached a safe distance from the aircraft, and then bringing them into alignment. The sequence that controls the action of the S-A is as follows:

1. An electrical signal received from the launching aircraft actuates the solenoid launch-latch, unlocking the mechanism.

2. The S-A senses missile actuation during the boost phase of flight and, if sufficient acceleration has been maintained, will advance to "commit-to-arm" position. If the missile motor malfunctions, and burnout occurs before the missile attains the minimum missile-to-aircraft separation distance, the S-A will not reach the commit-to-arm position, but will return to the SAFE position.

3. If missile acceleration is normal, the S-A will attain the commit-to-arm position and arming will be completed.

4. On target intercept, an electrical signal from the TDD firing circuit initiates the explosive train leading to the warhead booster, which detonates the warhead.

3-4 WARHEAD

Upon detonation, the Mk 48 warhead explodes into a ring of steel that is effective at all altitudes. Even at its maximum expansion, the steel ring can knife through the skin and skeletal members of the toughest aircraft structures. The capacity of the high explosive to withstand temperatures of 300° F makes it safe for adverse storage conditions and for carrying it aboard high-performance aircraft.

3-5 MOTOR

In a time span of 1 second, the Mk 36 motor functions as follows: (1) The pilot presses the trigger, which fires the gas-generator grain in the GCG. (2) The gas-generator grain ignites, supplying hot gas to drive the turboalternator. (3) The turboalternator turbine reaches a speed of 80,000 rpm, which generates a voltage across a load resistor in parallel with a tuned relay in the launcher. (4) The tuned relay in the launcher closes and supplies a 5-amp firing pulse to the aft contact button on the motor, which is

connected to the Mk 5 squib. (5) The squib ignites the booster charge, which ignites the igniter grain. (6) The igniter grain ignites the propellant charge. (7) The motor chamber is pressurized, which bursts the weather seal. (8) The burning gases are expanded through the nozzle with a resultant increase in gas velocity, which propels the missile forward.

3-6 AIRCRAFT EQUIPMENT

Details of pilot procedure are given in the handbook listed as item 3, paragraph 1-12.

3-7 LAUNCHER

The LAU-7/A launcher secures the missile during captive flight and releases it when it is fired by the pilot. The launcher supports the three missile hangers within a rail or track. The detent prevents forward or aft movement of the missile in flight until the missile is fired. The snubbers prevent other movement between the launcher and the missile. The umbilical-hook support restrains the umbilical block, which separates from the missile as the missile is launched.

The launcher contains electrical power supplies that supply 137-volt 6-kc power. Details of the launcher are given in the handbooks listed as item 4, paragraph 1-12.

Chapter 4

SHIPPING, HANDLING, AND STOWAGE

This chapter gives information on shipping, handling, and stowage requirements for the AIM-9C missile components.

Incoming and outgoing shipments should be logged and reported in accordance with procedures established for the AIM-9C missile.

4-1 CONTAINERS FOR MISSILE COMPONENTS

The identification, dimensions, and weight of containers, as well as figure numbers that illustrate these containers, are given in table 4-1. Additional information is presented in the following paragraphs.

4-1.1 GUIDANCE AND CONTROL GROUP CONTAINERS. Two Mk 12 GCGs are shipped from the depot in each Mk 270 Mod 1 container, figure 4-1. Containers for the Mk 12 guidance and control group are white and have a white band painted on the gray lid. The support-tube inserts and the plastic extractor used in packing this section are also white. Two colored dots on the lid of the container show which of the four color-coded crystal oscillators are installed in the two GCGs in that container.

Table 4-1. Containers for AIM-9C Missile Components

Identification	No. of Units	Dimensions, in.			Weight, lb			Figure No.
		Length	Width	Height	Empty	Container and Dunnage	Cont., Dunnage, and Component(s)	
GCG Container Mk 270 Mod 1	2	39.25	17.25	17.25	44	63	173	4-1
Fin Shipping and stowage cont. Mk 314 Mod 0	12	18.24	9.30	12.75	23	25	40	4-2
TDD Outer Container Mk 129 Mod 0	4	29.03	11.22	11.87	31	35.5	69.5	4-3
S-A Inner Container Mk 127 Mod 0	4	10.38	9.38	2.79	2	3	8	4-4
S-A Outer Container Mk 2 Mod 0	20	15.36	12.35	14.55	21	22	62.5	4-5
Warhead Container Mk 386 Mod 0	2	15.38	12.9	6.6	8.5	....	58.5	4-6
Motor Container Mk 287 Mod 0	1	73.56	8.23	6.75	30	....	129	4-7
Wing Assembly Cont. Mk 418 Mod 0	8	32.5	23.5	17.422	....	....	120	(not avail.)

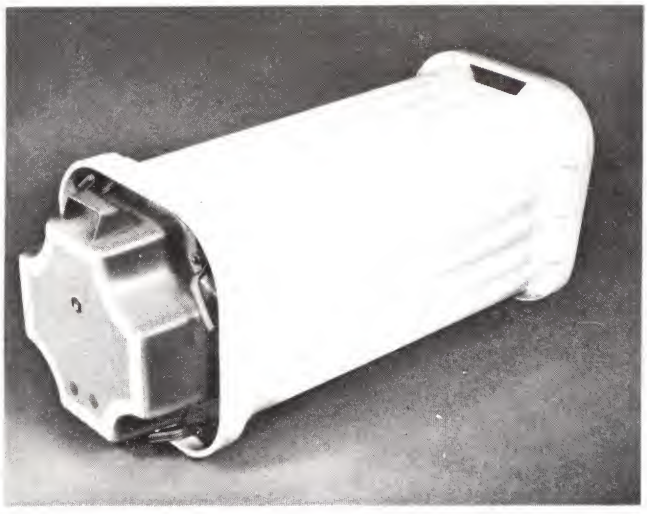


Figure 4-1. Container for Mk 12 Guidance and Control Group.

4-1.2 FIN CONTAINER. Four fins with O-rings and screws in place are packed in a fiberboard carton; three cartons are overpacked in a Mk 314 Mod 0 container. In each container there are also two T-handle wrenches, a package of spare O-rings, and a package of spare screws for the fins, crystal oscillator hatch cover, and umbilical. The loaded container measures 18.24 by 12.75 inches and weighs 40 pounds, figure 4-2.

4-1.3 TDD AND S-A CONTAINERS. The TDD and the S-A of the fuze are shipped separately.

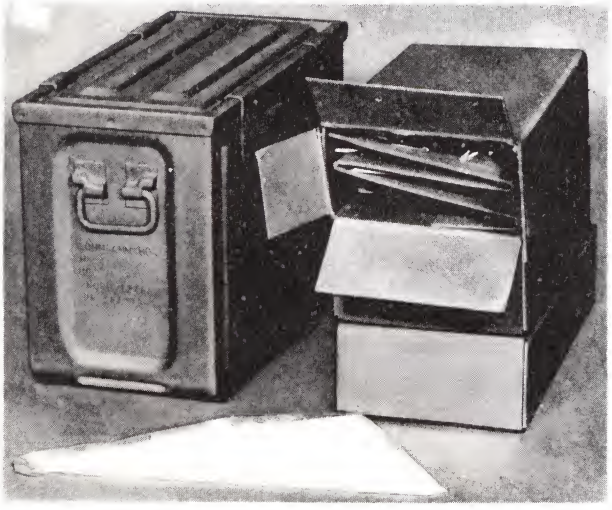


Figure 4-2. Container for AIM-9C Fins

Each component is hermetically sealed by the manufacturer and should not be removed from its container until it is needed for assembly.

4-1.3.1 TDD Container. The IR and RF TDDs are shipped from the depot in the Mk 129 container, figure 4-3. Each TDD is sealed in an individual polyethylene bag for protection against dust and moisture. Four TDDs are placed in each outer container.

NOTE: Do not place IR TDDs in a container that was used to ship RF TDDs or vice versa.

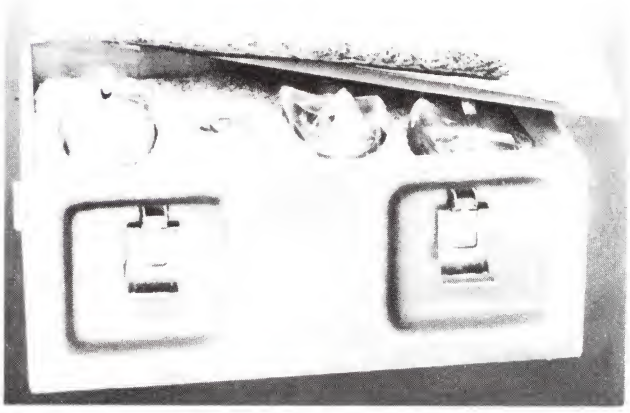


Figure 4-3. TDDs in Outer Container.

4-1.3.2 S-A Container. Four S-As, packed in vibration-absorbing and shock-absorbing material, are packed in the Inner Container Mk 127 Mod 0, figure 4-4. Normally, five inner containers are packed in each Outer Container Mk 2 Mod 0 (ammunition component box), figure 4-5.

4-1.4 WARHEAD CONTAINER. The aluminum Container Mk 386 Mod 0 is used to ship two warheads, figure 4-6.

4-1.5 MOTOR CONTAINER. The steel Container Mk 287 Mod 0 with motor is shown in figure 4-7.

4-1.6 WING ASSEMBLY. Eight wings, with the rollerons protected by plastic caps, are shipped in the Container Mk 418 Mod 0.

4-2 ASSEMBLY EQUIPMENT AND TOOLS

An assembly stand, tube spanner wrench, torque wrench, Allen wrench, and special screw-

Figure 4-4. S-As in Inner Container.

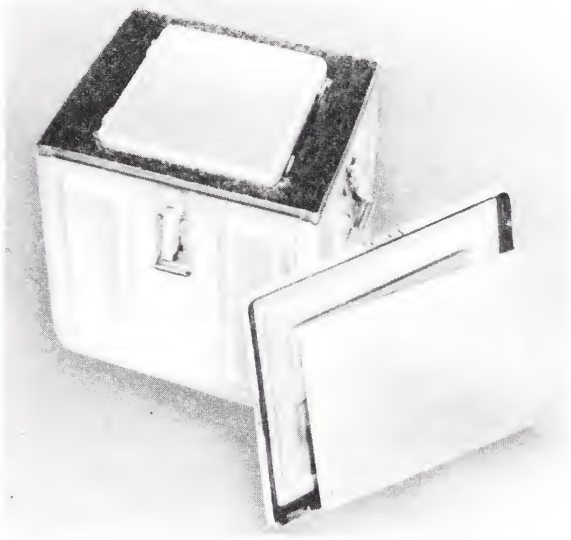


Figure 4-5. S-As in Outer Container.

driver are required for assembly of the AIM-9C. A T-handle wrench is used to install the fins on the Mk 12 GCG.

4-2.1 ASSEMBLY STAND. The assembly stand, figure 4-8, is 46 inches long, 32 inches wide, and 35 inches high, and weighs about 35 pounds. It can be disassembled for bulkhead storage. When disassembled and stowed, the stand occupies a space 46 inches long, 32 inches wide, and 8 inches high.

4-2.2 ASSEMBLY TOOLS. Tools shown in figure 4-9 include a special screwdriver, bottle wrench, socket-head (Allen) wrench, tube spanner wrench, torque wrench, and T-handle wrench.

4-3 HANDLING EQUIPMENT

Bomb skids with adapters are used aboard ship for transporting AIM-9C missile components and coolant tanks and for transporting fully assembled missiles to the aircraft or to ready-service stowage compartments.

Specifically, the equipment consists of the Aero 12B and 21A bomb skids, Aero 8C-1, 9B, 39B, and 84A adapters and the Aero 30A-1 vibration isolators.

Upon receipt, the GCGs are hand-carried in their containers to the GCG stowage compartment.

4-3.1 AERO 12B BOMB SKID. The Aero 12B bomb skid is a two-wheel skid used for transporting various missile components. It can be fitted with extra-length handles for transporting assembled missiles if the Aero 21A skid is not available.

4-3.2 AERO 21A BOMB SKID. The Aero 21A bomb skid is a four-wheel skid that is fitted with the Aero 84A adapter, figure 4-10, for transporting assembled missiles.

4-3.3 AERO 8C-1 ADAPTER AND AERO 30A-1 VIBRATION ISOLATOR. The Aero 8C-1 adapter is an Aero 8C that has been modified by substituting longer hanger arms to accommodate the AIM-9C wings. The Aero 8C-1 and Aero 30A-1

Figure 4-6. Warhead Container.

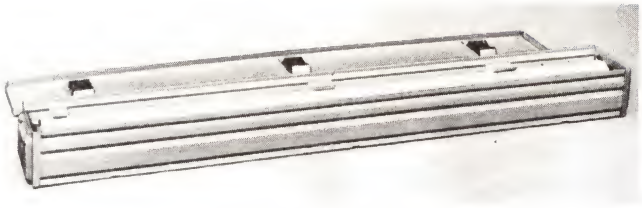


Figure 4-7. Motor Container (With Motor Ready To Ship).

vibration isolator are used with the bomb skid to transport motors and missiles, figure 4-11, and also for the stowage of four assembled missiles in ready-service stowage magazines. Spare crystal oscillators to match those in the missiles on the adapter are carried in a box on the adapter. The Aero 8C-1 adapter weighs approximately 45 pounds; it is 27 inches long, 19 inches high, and 22 inches wide.

4-3.4 AERO 9B ADAPTER. The Aero 9B adapter on the Aero 12B bomb skid, figure 4-12, is used to transport warheads, TDDs, S-As, wings, and fins. The adapter alone weighs 23 pounds and when on the bomb skid, the total weight is 185 pounds. The box-like Aero 9B adapter is collapsible to 43 inches by 17-1/2 inches by 4-1/2 inches when not in use.

4-3.5 AERO 39B ADAPTER. The Aero 39B adapter is used to transport coolant tanks (bottles) through ship spaces. Each adapter can hold seven tanks, and three Aero 39B adapters can be loaded on the Aero 12B bomb skid. The adapter weighs 29 pounds and is 54 inches long, 11-7/8 inches wide, and 11-3/8 inches high. A loaded Aero 39B adapter is shown in figure 4-13.

4-3.6 COLLAPSIBLE ASSEMBLY TRAY. The collapsible assembly tray, figure 4-14, is used for assembly of the TDD and S-A to the GCG, and for attaching fins to the GCG before testing on the Mk 401 test set. The assembly tray is assembled with the rear support in the appropriate position for the AIM-9C. The TDD tray can be placed on either side of the rear support. The TDD is placed in the TDD tray and the plugs are mated before the TDD is assembled to the GCG. It is possible to rotate the GCG through 360 degrees with four fins on the GCG. This assembly tray is not to be used for storage of components.

4-4 RECEIVING INSPECTION

All components of the AIM-9C missile should be inspected upon receipt. Inspect the shipping containers for evidence of rough handling or damage such as deep cuts, dents, or broken fasteners. Make certain that each shipping container is intact. If there is evidence of damage to the container, the components must be inspected carefully before stowing or before assembly. If a motor in its container is dropped more than 6 inches, it shall be disposed of in accordance with regulations. (See paragraph 5-8 for disposition of damaged components.)

4-5 STOWAGE

4-5.1 GUIDANCE AND CONTROL GROUP. Two GCGs are shipped in each Mk 270 container. Six containers may be palletized on the Mk 7 Mod 0 pallet. GCGs are stowed in their shipping containers until ready for actual assembly.

4-5.2 FUZES. Four TDDs are shipped in each Outer Container Mk 129. Twenty S-As are shipped in Outer Container Mk 2. TDDs and S-As are stowed in their shipping containers in the GCG stowage compartment.

4-5.3 WARHEAD. Two warheads are shipped in Container Mk 386. When received, the warheads are removed from the container and placed in appropriate HE stowage areas.

4-5.4 MOTOR. One motor is shipped in each steel Container Mk 287. The motors are removed from containers and stowed in appropriate magazines, on approved stanchions, in the horizontal position only.

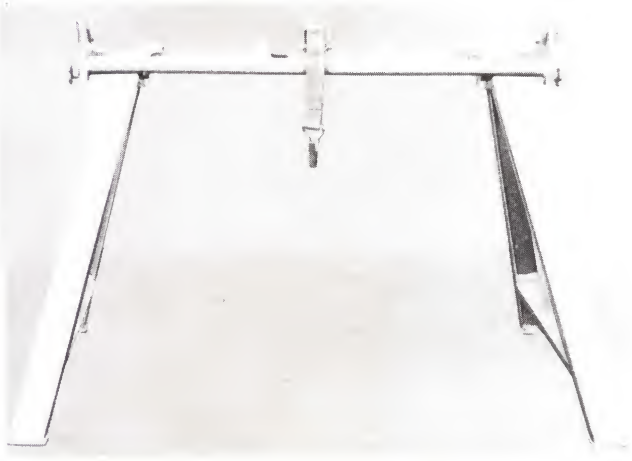
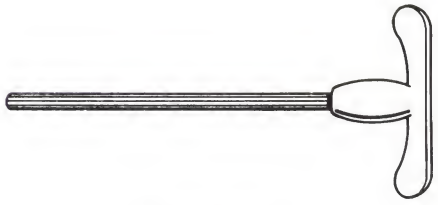


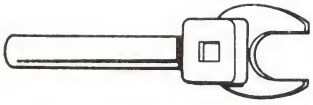
Figure 4-8. Assembly Stand.

3351

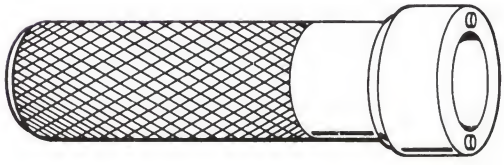
SOCKET-HEAD (ALLEN) WRENCH



T WRENCH

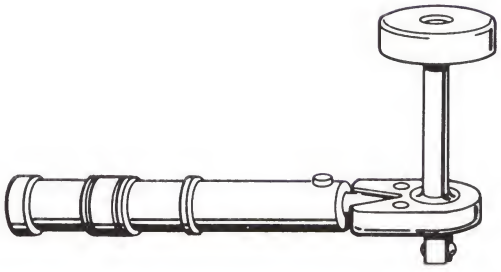


BOTTLE WRENCH



TUBE SPANNER WRENCH

SCREWDRIVER



TORQUE WRENCH

Figure 4-9. Assembly Tools.

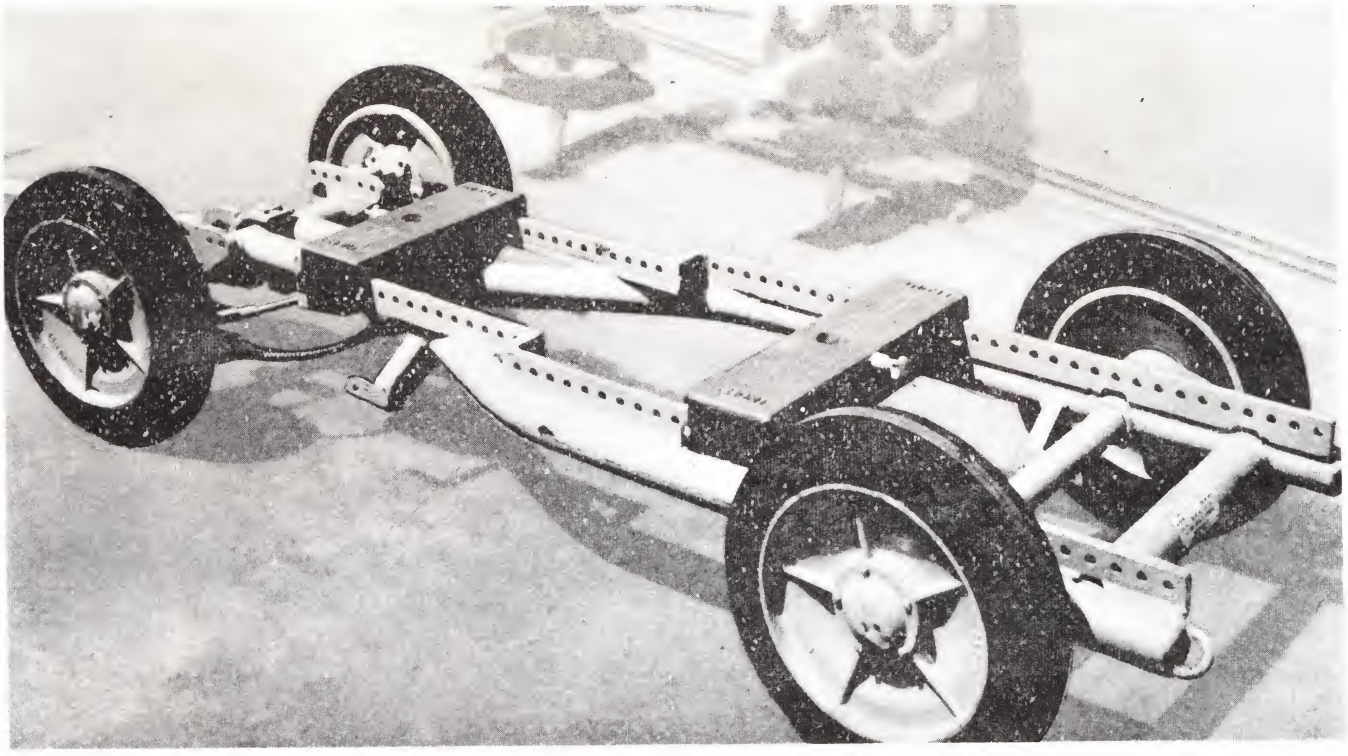


Figure 4-10. Aero 84A Adapter on Aero 21A Bomb Skid.

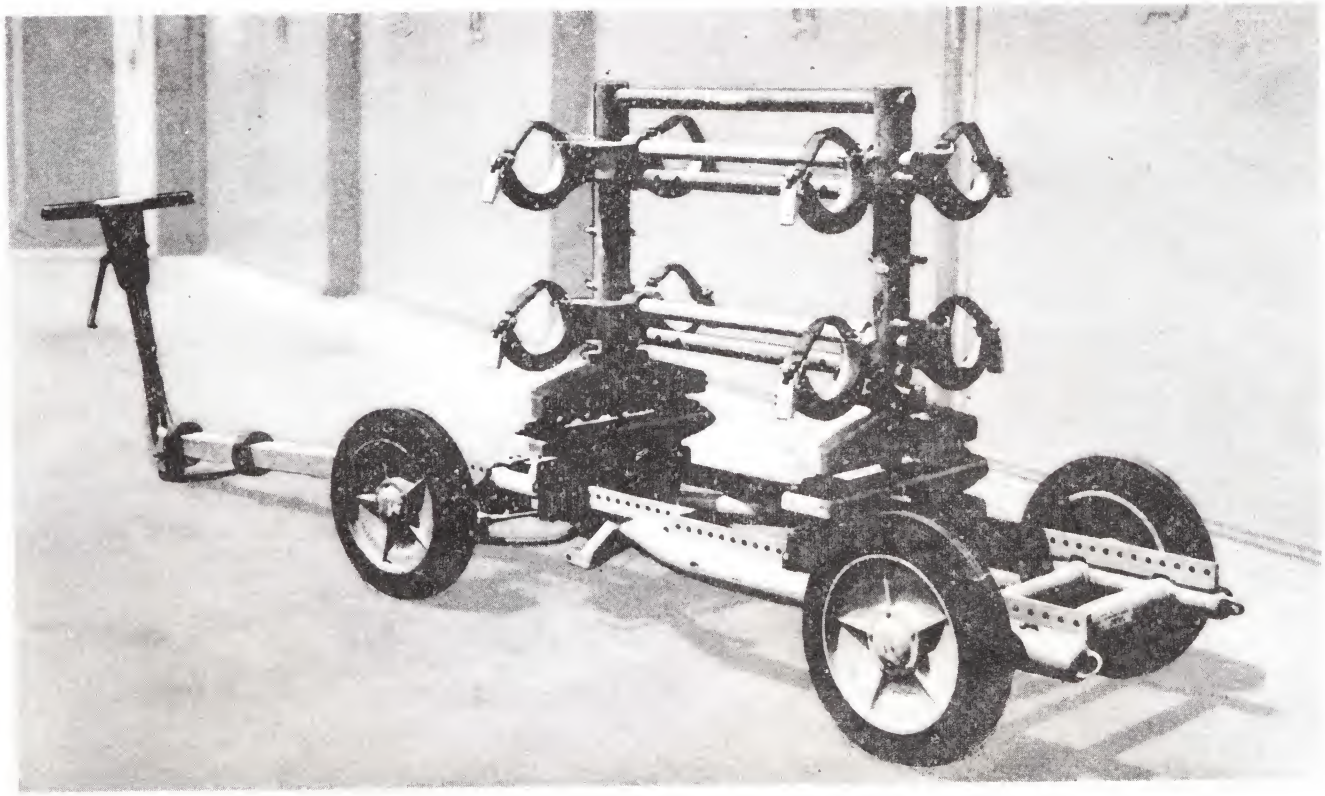


Figure 4-11. Aero 8C-1 Adapter and Aero 30A-1 Vibration Isolator on Bomb Skid.

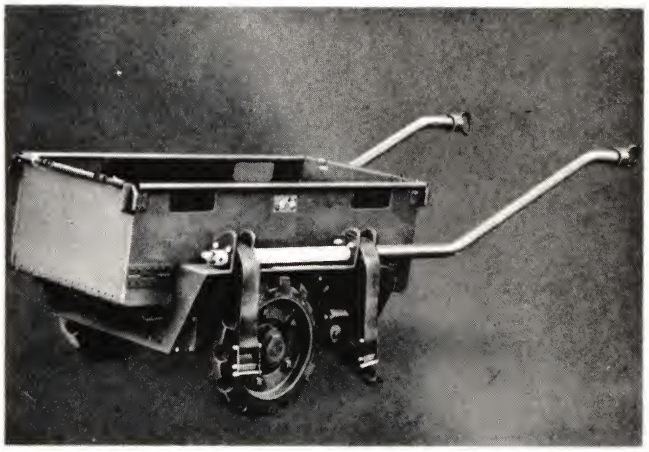


Figure 4-12. Aero 9B Adapter on Aero 12B Bomb Skid.

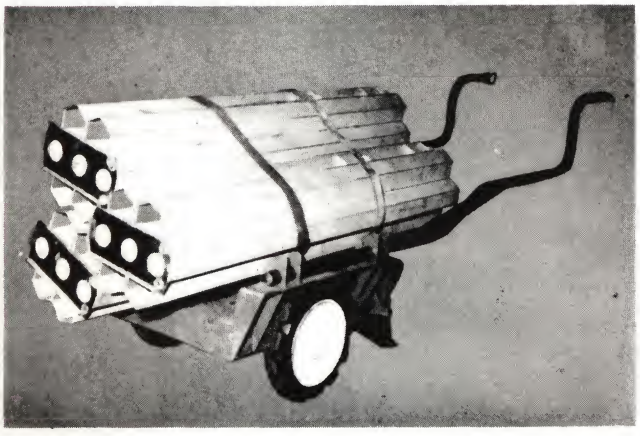


Figure 4-13. Aero 39B Adapter With Coolant Tanks.

WARNING

Do not apply excessive pressure to the motor case when securing the motor to the stanchions, as degradation of the bonded propellant may result.

The estimated storage life of the Mk 36 motor is 5 years within the limits of -65 to 165° F.

4-5.5 WINGS AND FINS. These components can be stowed in inert stowage areas.

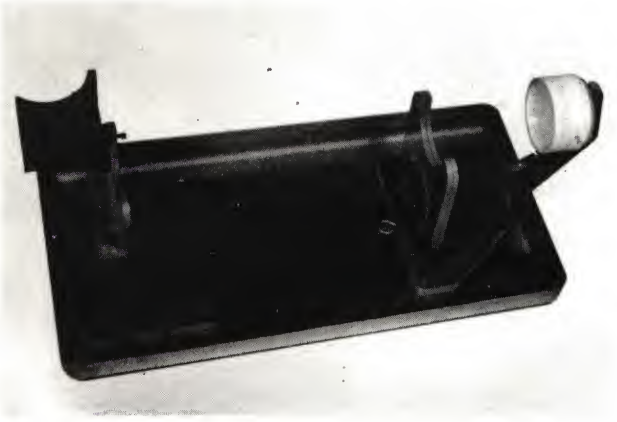


Figure 4-14. Collapsible Assembly Tray.

Chapter 5
OPERATION

The assembly of the AIM-9C missile shall not start until all team members have been briefed on the details of each step. Two team members are required to assemble the weapon; three members are required to load the missile on the aircraft. Only those tools specified in chapter 1 are to be used in the assembly operation.

5-1 DECANNING

In the breakdown area, the motors, warheads, wings, and fins are removed from their containers and inspected. Disposition of damaged units is given in paragraph 5-8. The motors are moved on the Aero 8C-1 adapter to approved stowage areas and placed on stanchions in the horizontal position only. The warheads, wings, and fins are decanned and moved on the Aero 9B adapter to appropriate stowage -- warheads in HE magazines, fins and wings in inert stowage areas. The TDDs, S-As, and GCGs in their containers are moved to the GCG stowage compartment and remain in containers until ready for assembly.

5-2 GCG DECANNING IN GCG STOWAGE COMPARTMENT

> CAUTION: Do not remove a component from stowage or from its container until it is required in the assembly operation.

Proceed as follows:

1. Choose a Mk 12 GCG container that shows colored dots corresponding to desired missile-crystal configuration. Back off the screw on container lid to relieve air pressure in container. Use diagonal cutters to cut safety wire on cover lid dogs. Handles can be opened by hand. Extract GCG by plastic end-cap handle, but do not carry missile by plastic end-cap handle. Place GCG in assembly tray on bench and remove plastic end cap.

> CAUTION: Never lift the GCG by the umbilical. Be careful that the ceramic radome does not rub against brass belt buckles of personnel when the GCG is lifted to waist height.

2. Inspect radome for cracks or any separation between ceramic and metal joint; either is cause for rejection. If radome is dirty, clean it with soap or cleanser and water.

> CAUTION: DO NOT let water get on any other part of GCG.

5-3 CHECKOUT WITH MK 401 TEST SET

1. Install two fins in first two positions to left of umbilical connection looking from after end of GCG (opposite crystal oscillator hatch cover).

2. Insert GCG in Mk 401 test set. Follow condensed operating instructions on side of anechoic chamber; detailed operating instructions are found in the manual listed as item 5, paragraph 1-12. The GCG must pass all tests on the Mk 401 test set; otherwise, it is a reject.

3. Make sure crystal oscillator is in place and that decal on hatch cover matches oscillator. Secure hatch cover with four screws.

> CAUTION: Never drop crystal oscillator hatch cover screws into the hatch. Never secure the cover with anything but the special hatch cover screws. Spare screws are found in the spare parts bag in the fin container.

4. Remove GCG from test set, replace it in the assembly tray, and remove fins.

5-4 GCG FUZE ASSEMBLY

> **WARNING**
>
> Always assemble the TDD to the GCG, and then assemble the S-A to the GCG-TDD combination. Never assemble a fuze as a single unit.

1. Determine which TDD (RF or IR) is to be used for desired missile configuration.

2. Remove TDD from outer container. Place TDD in its inner plastic bag on a smooth surface, and cut top of bag to remove TDD.

> CAUTION: Do not remove the protective tape from the windows of the IR TDD, and do not remove the red plastic cap from the electrical connector on either TDD.

3. Place O-ring in groove of TDD mating ring if one is not there. Check to see that the O-ring fits snugly and is not crimped.

4. Place TDD in TDD tray on assembly tray. Inspect 9-pin and 15-pin plugs to make certain plugs are dry, clean, and free of grease and dirt. Line up GCG cables and female connectors with 9-pin and 15-pin receptacles on forward end of TDD.

5. Connect plugs and female connectors at end of cable of GCG. Press firmly to make sure that connectors fit together securely, thus assuring good electrical connection.

6. Secure screws that hold plugs and connectors together, figure 5-1(a).

> CAUTION: Because the plug body is made of cast aluminum, use caution while securing plug retainer screws. The tabs can easily be broken by too much pressure.

7. Assemble TDD to GCG. Tighten clamp ring between GCG and fuze to 100 pound-inches with torque wrench, figure 5-1(b).

WARNING

> No electrical checks are to be made on the S-A by handling personnel.
>
> NOTE: Detonators in the S-A are of the bridgewire variety and are not safe when subjected to more than 5-ma current. For example, a Simpson meter delivers enough current during tests to initiate the detonators.

8. Remove S-A from its container and examine it carefully for damage.

WARNING

> The S-A contains a sensitive explosive and must be handled with care. DO NOT drop the S-A or attempt to assemble an S-A to a TDD if the S-A has been damaged, has been dropped, or is suspected of having been dropped. Such an S-A shall be repacked and instructions for its disposition requested from the Bureau of Naval Weapons.
>
> As the S-A is hermetically sealed at the factory and all tests are made before shipment from the depot, no tests, adjustments, or checkout procedures shall be made by handling personnel, except visual inspection of the SAFE-ARMED indication in the window of the S-A.
>
> Always grasp the S-A at the end close to the retainer ring. Keep handling of the S-A to a minimum.

The next step is a two-man inspection.

9. Inspect SAFE-ARMED window to determine that letter "S," indicating SAFE, is visible.

WARNING

> DO NOT use an S-A if by visual inspection (1) it is found to be in the A (ARMED) position, or (2) it cannot be determined to be in the S (SAFE) condition.

On the basis of this inspection, the following action shall be taken:

a. One team member makes a signed entry on the attached inspection tag, indicating that the unit was examined and found to be safe.

b. If the letter "A," indicating ARMED, or no letter is visible in the window, the S-A shall be disposed of immediately in accordance with existing regulations. A report of the incident, together with the inspection tag, shall be forwarded to the Bureau of Naval Weapons.

If under paragraph 9a, above, the S-A is safe, proceed as follows:

10. Remove plastic caps from circular

female connector at after end of TDD and from 6-pin circular male connector at forward end of S-A. Inspect connectors to make sure they are dry, clean, and free of grease and dirt.

WARNING

The S-A contains a sensitive explosive; therefore, when assembled to the GCG and TDD, the unit shall be handled with the same care given any item of explosive ordnance.

11. Align stud on 6-pin male connector at forward end of S-A slot with slot on female connector at after end of TDD, and mate two connectors, figure 5-1(c).

12. Screw threaded retainer ring of S-A into threaded receptacle on TDD and tighten firmly with spanner wrench, figure 5-1(d).

13. Place dome cover on GCG, figure 5-1(e), and insert stopper attached to dome cover into gas vent. If protective tape is not over windows of IR TDD, place cover on TDD. On CVA-57 Class ships, carry the GCG-TDD combination to assembly room.

CAUTION: When the seeker is not operating, the radome should be covered by a protective RF-shielding cover to prevent receiver damage by radars operating in the vicinity.

5-5 ASSEMBLY AREA OPERATION

The assembly stand is removed from the bulkhead and set up, figure 5-1(f), by inserting tongue of leg in slot of saddle assembly, rotating leg until joint is engaged, tightening setscrew in flange of saddle assembly, and tying down the stand.

WARNING

Do not alter or attempt to repair any part of the motor or igniter. Avoid jarring or dropping the motor. A cracked grain may cause motor blow-up on firing. Do not use a motor that has been dropped or has a damaged (punctured or cracked) nozzle weather seal. Do not probe or punch weather seal with fingers or tools. Reject any motor that has been dropped or damaged, and dispose of in accordance with regulations.

1. Inspect the motor before assembly. If there is evidence of any form of damage, reject the motor. Proceed as follows:

a. Examine forward closure to make sure that both electrical leads from forward hanger are intact and attached to terminals.

b. Make sure shorting clip is in place on forward lug.

c. Inspect forward clamp ring for damage.

d. Visually inspect exterior of motor tube for corrosion, rust, dents, nicks, or evidence of damage, rough handling, or deterioration.

e. Inspect wing ribs for damage or irregularities.

f. Inspect all three hangers for evidence of damage or mishandling.

g. Inspect nozzle exit cone and weather seal for cracks or punctures.

2. Place motor in two "V" supports of assembly stand, and position motor with launching lugs up, figure 5-1(g). Secure motor on stand with center band.

WARNING

The warhead is potentially dangerous ordnance material and should be handled in accordance with existing ordnance regulations for Class A explosives. Do not perform any alterations on the warhead or attempt to disassemble any of its parts. If a warhead is damaged, it shall be disposed of in accordance with local instructions.

3. Inspect recess of warhead to verify that black rubber ring is cemented in bottom of recess.

NOTE: This ring cushions S-A. If not in place, do not use warhead. Return it to issuing depot with a description of the deficiency.

4. Insert warhead into forward end of motor so that alignment pin mates with slot provided (see arrows on motor and warhead).

NOTE: Some pressure will be required to overcome the force of the compression springs supporting the nonpropulsive head closure and to achieve proper mating.

5. Torque clamp ring socket-head screw between warhead and motor to 100 pound-inches with torque wrench, figure 5-1(h).

CAUTION: Failure to assemble mating parts properly can result in rocket motor failure and missile breakup near the firing aircraft, which may cause missile components to strike the aircraft.

6. Align assembled GCG-fuze combination with warhead-motor combination with alignment pins and slots. Gently slide front section aft, fitting aft end of S-A carefully in opening of warhead recess. Tighten clamp ring between fuze and warhead to 100 pound-inches with torque wrench, figure 5-1(i).

7. Check rolleron wheel to see that it spins freely, figure 5-1(j). Position wings in ribs at rear of motor. Use torque wrench to tighten setscrews at aft end of wing ribs (refer back to figure 5-1(i)). Never force a wing onto a wing rib.

CAUTION: Avoid striking or damaging the rollerons in any way.

NOTE: In disassembly of the missile, the setscrew is to be unscrewed about 1/2 inch.

8. The crystal oscillator assembly in the GCG is identified by the colored numbers on the hatch cover on the GCG. If it is necessary to change the crystal oscillator assembly, remove the hatch cover by unscrewing the four screws that secure it to the GCG. Gently pull the crystal can from its plug-in position and place it in stowage. Plug in a crystal can of the desired color, put matching colored number decal on hatch cover, replace the cover and tighten the screws.

CAUTION: In the missiles, use only crystal oscillator assemblies marked with the decal "SUITABLE FOR AIM-9C MISSILE AIR FIRING." Any crystal oscillator assembly (with or without this decal) can be used in aircraft radars.

NOTE: There are extra screws for the crystal oscillator hatch cover in the spare parts bag in the fin container.

9. Attach fins to GCG with screws, figure 5-1(k).

NOTE: The fins are shipped in the fin container with screws in each fin. Two Bristol T-handle wrenches, used to attach the fins, and a package containing spare O-rings and screws for the fins, are shipped in the fin container.

10. Place assembled missile, figure 5-1(l), on Aero 21A bomb skid with Aero 8C-1 adapter.

NOTE: The Aero 8C-1 adapter will hold four assembled missiles.

11. Select crystal oscillators with colored numbers to match those on Aero 8C-1 adapter. Place in the box provided for this purpose; and hang it on 8C-1 adapter.

5-6 SEQUENCE OF ASSEMBLY STEPS AND MANPOWER REQUIREMENTS

Table 5-1 presents step-by-step procedures and manpower requirements. Figure 5-1 shows the step-by-step assembly.

5-7 LOADING MISSILES ON LAUNCHER

All nonessential personnel should be cleared from the immediate area of the launcher operation.

To load missiles on the launcher, three team members are required. These procedures are illustrated in figure 5-2.

NOTE: Test launcher for proper operation before the following steps are begun.

5-7.1 COOLANT TANK INSTALLATION. A coolant tank is to be carried in every LAU-7/A launcher station at all times to keep the seal valve clean.

CAUTION: Handle coolant tanks with care at all times. It is essential that the seal valve at the forward end of the coolant tank be kept free of sand, dust, oil, grease, water, and other

Table 5-1. Assembly Procedures and Manpower Requirements

Steps 1 through 5 are performed in the GCG stowage compartment. Two men are needed.

Step No.	Team Member No. 1	Team Member No. 2
1	Remove GCG from container. Place on tray.	
2	Remove TDD from outer container. Place TDD in inner plastic bag on smooth surface, and cut top of bag. Remove TDD from inner plastic bag.	Place O-ring in groove of TDD mating ring if none there. Inspect 9-pin and 15-pin plugs on forward end of TDD to see that they are free of dust, grease, etc. Line up GCG cable and female connectors with male plugs on forward end of TDD. Connect plugs and female connectors. Press firmly to make good electrical connections. Tighten clamp ring.
3	Remove S-A from container. Inspect S-A window for safety.	Confirm safety of S-A window.
4	Make S-A inspection entry on attached inspection tag.	Remove plastic caps from ends of TDD and S-A. Assemble S-A to TDD, which is attached to GCG.
5	Place dome cover on GCG nose. If protective tape not on IR TDD, also place cover on TDD.	Hand-carry GCG-fuze assembly to dumbwaiter or assembly area.

Steps 6 through 11 are performed in the assembly room. Three men are needed.

Step No.	Team Member No. 1	Team Member No. 2	Team Member No. 3
6	Remove assembly stand from bulkhead. Insert tongue of leg into slot of saddle assembly. Rotate leg until joint is engaged. Tighten setscrew in flange of saddle assembly.		
7	Place motor on stand with launching lugs up.		
8	Inspect warhead recess for black rubber ring. Assemble warhead to motor, using torque wrench to tighten clamp ring to 100 pound-inches.		Assemble wings to motor using torque wrench. Inspect wings for damage; see that rolleron wheels spin freely.
9	Attach GCG-fuze combination to warhead-motor combination. Using torque wrench, tighten clamp ring to 100 pound-inches.		
10	Attach fins to GCG.		
11	Place assembled missile (with dome cover and, if required, TDD cover) on bomb skid with Aero 8C-1 adapter.		

contaminants. NEVER APPLY ANY OIL, GREASE, OR OTHER LUBRICANTS TO THE LARGE THREADS ON THE SEAL VALVE.

To place the coolant tank in the launcher, proceed as follows:

1. Unlatch and rotate handle of launcher aft fairing to the horizontal position, and pull aft fairing back approximately 1/2 inch, figure 5-2(a).

NOTE: The fairing opens with a clam-shell action and is held open by springs loaded outward.

2. Release coolant tank retention clamp on launcher.

3. Insert coolant tank into launcher, figure 5-2(b). Guides, within the launcher housing, position the tank so that the threads at the forward end of the tank engage those of the seal valve.

NOTE: Normally, the coolant tank fits easily into the launcher without using special tools. If necessary, however, the bottle wrench, figure 5-2(c), can be used.

4. Rotate coolant tank in clockwise direction until it is snug, figure 5-2(d).

CAUTION: Never leave the launcher unattended with the aft fairing open.

5. Secure coolant tank retention clamps.

6. Close aft fairing, push fairing forward, and rotate handle forward, figure 5-2(e), until fairing is latched.

5-7. 1. 1 Missile Loading. If possible, the aircraft should be pointed toward a clear area, away from other aircraft and structures. The steps for loading the missile on the launcher are as follows:

WARNING

Do not stand directly in front of or behind the missile during loading operation. Stand clear of the launcher at all times after the missile is loaded on the launcher. VERIFY the safe condition of the launcher and aircraft before loading the missile on the aircraft by checking each of the following conditions:

a. Make certain that combination detent wrench-safety pin is installed properly.

b. Verify that cockpit switches are in the following positions:

MASTER ARMAMENT switch	OFF
COOLING switch	OFF
ARMAMENT SELECTOR switch	OFF

c. Verify that aircraft engines are OFF and that auxiliary power is NOT connected to aircraft.

d. Ground the aircraft.

After these checks are made, proceed as follows:

1. Remove shorting clips from motor and GCG, and remove TDD cover.

2. Depress nose latch button and slide nose fairing forward.

3. Position missile so that lugs enter three slots in launcher rail. Turn detent wrench-safety pin to raise detent. Slide missile forward into position and release detent wrench-safety pin, figure 5-2(f). Never force a missile onto the launcher.

4. Check umbilical hook for damage; then attach umbilical hook to missile umbilical block by pushing hook down until it snaps into place over the umbilical-block pin.

CAUTION: The forward-receptacle dust cap must be kept in place on the launcher power-supply receptacle at all times when a missile is not installed on the launcher. The upper-receptacle dust cap must be on the aircraft-pylon receptacle on the launcher top side WHENEVER the launcher is removed from the aircraft.

5. Remove forward-receptacle dust cap shown in figure 5-2(g) and connect missile umbilical cable to launcher power-supply receptacle.

NOTE: When an AIM-9B missile

is installed, an adapter must be placed between the missile umbilical cable and the launcher power-supply receptacle.

6. Push nose fairing home.

7. Check to see that crystal oscillator in radar synchronizer in cockpit matches those in the radar missiles. If oscillator in aircraft does not match, replace it with oscillator carried in box on 8C-1 adapter.

8. Remove dome cover with gas-vent stopper and rolleron caps from missile, figure 5-2(h), just before taxiing forward.

9. Pull detent wrench-safety pin just before aircraft catapult.

5-7.1.2 Missile Unloading. When the aircraft returns from its mission with AIM-9C missiles aboard, the following operation shall be performed before the missiles are unloaded. The following checks are necessary for safe unloading operation:

a. Insert detent wrench-safety pin into launcher as soon as possible after aircraft lands.

b. Turn aircraft engines OFF. Verify that cockpit switches are in the following positions:

MASTER ARMAMENT switch . . . . OFF
COOLING switch . . . . . OFF
ARMAMENT SELECTOR switch . . . OFF

c. Ground the aircraft.

d. Place TDD cover on missile.

e. Place dome cover on GCG of missile and insert stopper.

f. Place rolleron caps on wing rollerons.

WARNING

Do not stand directly in front of or behind the missile during unloading operations unless absolutely necessary.

After the checks are made, unloading of the missile proceeds as follows:

1. Depress nose latch. Pull nose fairing forward, and disconnect missile umbilical cable from launcher power-supply receptacle. Place dust cap on forward receptacle. Disconnect umbilical hook. Close nose fairing.

2. Open handle on aft fairing, which automatically releases rear snubbers.

3. Turn detent wrench-safety pin to raise detent.

4. Support missile firmly and slide it aft until it drops through launcher loading slots.

WARNING

DO NOT REMOVE the detent wrench-safety pin.

5. Place missile on bomb skid with Aero 8C-1 adapter and return missile to ready-service stowage or disassemble and return components to proper stowage areas.

5-7.1.3 Coolant-Tank Removal. To remove the coolant tank from the LAU-7/A launcher, proceed as follows:

1. Unlatch and rotate handle of launcher aft fairing to horizontal position and pull aft fairing assembly back approximately 1/2 inch.

2. Release coolant tank retention clamp.

3. Rotate tank in a counterclockwise direction until forward threads of tank are disengaged.

4. Pull tank straight out of launcher.

5-8 HANDLING AND DISPOSITION OF PHYSICALLY DAMAGED AIM 9C COMPONENTS

Each component of the AIM-9C missile shall be visually inspected before and after assembly. Specific instructions are as follows:

5-8.1 GUIDANCE AND CONTROL GROUP. Return to the depot any GCG that has a cracked or stained radome (one that warm water and a detergent will not clean) or that shows a separation between the ceramic to metal joint, or any GCG that is rejected when tested on the Mk 401 test set (see chapter 6).

5-8.2 FUZE. Dispose of, in accordance with regulations, any fuze (TDD and S-A) that is

damaged in any way that prevents assembly to other components, especially if threads or walls are damaged.

5-8.3 WARHEAD. Give particular attention to the ends, cavities, and outer walls of warheads. Dispose of, in accordance with regulations, any warhead that is damaged in a way that prevents assembly with other components of the missile.

5-8.4 MOTOR. Dispose of, in accordance with regulations, any motor that has been dropped or damaged. If a motor in its container is dropped 6 inches or more, it shall be disposed of in accordance with regulations.

5-8.5 WINGS AND FINS. Do not use bent or damaged wings or fins. Dispose of, in accordance with regulations, any wings or fins that are damaged so that assembly cannot be made. Do not use wings with damaged rollerons.

5-9 HANDLING AND DISPOSITION INSTRUCTIONS FOR MISFIRED MISSILES

If jettison fails or the pilot elects to return with a misfired AIM-9C missile, the following precautions shall be taken before landing:

1. Place armament selector switch in OFF position.

2. When flight operations permit, wait at least 10 minutes from the time that the trigger is last depressed before landing the aircraft with a misfired missile aboard, or follow local command instructions.

The following additional precautions shall be taken after landing.

1. After aircraft has landed with a misfired AIM-9C missile aboard, put the detent wrench-safety pin in place immediately and spot aircraft in a safe position, pointed toward a clear area.

2. Wait at least 10 minutes before unloading the missile.

3. Disassemble missile following the reverse of the procedures in paragraphs 5-2 through 5-6. Inspect each component as it is disassembled. Dispose of damaged components in accordance with applicable regulations. The GCG must be tested on the Mk 401 test set (see chapter 6). The TDD must be sent to the appropriate ammunition depot for further disposition. The S-A must be inspected; if the "S" in the window shows, it can be reused. If not, it must be disposed of immediately in accordance with existing regulations. The motor is disposed of in accordance with existing regulations.

Chapter 6
MAINTENANCE AND TESTING

The AIM-9C missile and the LAU-7/A launcher have been designed for minimum maintenance and testing. However, the operational suitability of the missile, the launcher, and the aircraft need to be checked at regular intervals. The special equipment discussed in the following paragraphs, along with other readily available shop equipment, is all that is required to check out the complete missile and launcher system.

6-1 MK 401 TEST SET

This test set checks Mk 12 GCG functions through a series of operator-controlled tests. Various test readings are required. Details of the test set are given in the manual listed as item 5, paragraph 1-12.

The Mk 401 test set, figure 6-1, for the Mk 12 comes in three sections--the control unit, the anechoic chamber, and the mechanical adapter. Condensed operating instructions are mounted on the side of the anechoic chamber. Instructions on the use and maintenance of the test set are given in the handbook listed as item 5, paragraph 1-12.

6-2 REQUIREMENTS FOR TESTING MK 12 GCG

Maintain a log on every GCG using the numbers stencilled on the skin of the GCG. The Mk 12 GCG must be checked out on the Mk 401 test set when first received and just before it is assembled into a missile, unless at General Quarters. GCGs in ready service must be retested every 30 days and after every five arrested landings. Every six months check the GCGs in containers in stowage. Check the condition of the desiccant; if it is blue, replace it or dry it in an oven to pink. Check the GCGs in the container in the test set. Return GCGs and desiccant to each container, and pump up to four pounds of air pressure.

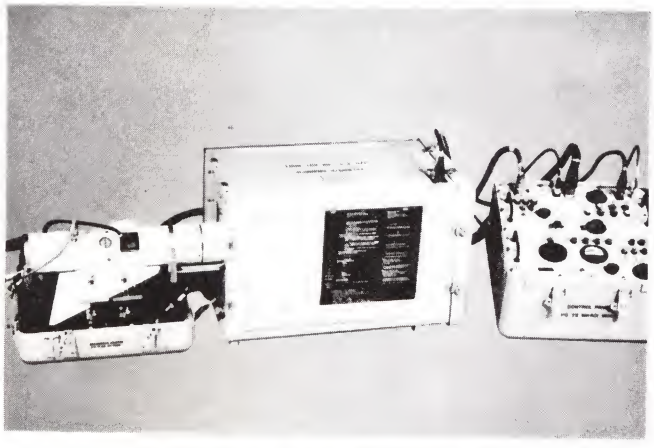


Figure 6-1. Mk 401 Test Set.

Whenever the pilot reports difficulty tuning the missile, check the GCG on steps 1 and 2 on the test set; for pilot tone difficulties, check steps 1, 2, 3, and 4 on the test set.

6-3 GUIDED MISSILE LAUNCHER TEST SET AN/ASM-20

The test set equipment, figure 6-2, consists of the following components: transit case, test set, cable assembly, set of four adapters, pressure gage, and two hexagonal wrenches. A pilot's headset, compatible with the aircraft being tested, and an auxiliary power source to energize the aircraft circuitry, must be available. The test set in its case is 16 inches long, is 10 inches wide, is 8 inches high, and weighs 28 pounds. Instruction cards and two copies of the handbook listed as item 6, paragraph 1-12, are included with each test set.

With the correct adapter, the test set checks the aircraft and launcher circuits with the launcher installed on the aircraft. If the launcher does not check out, remove the launcher and test the aircraft circuitry with a different adapter. In this way, determine whether the problem is in the launcher or aircraft circuitry.

> CAUTION: The AN/ASM-20 test set is susceptible to high level electromagnetic radiation. Under such an environment, test readings are unreliable. (Modifications to eliminate this problem are being developed.)

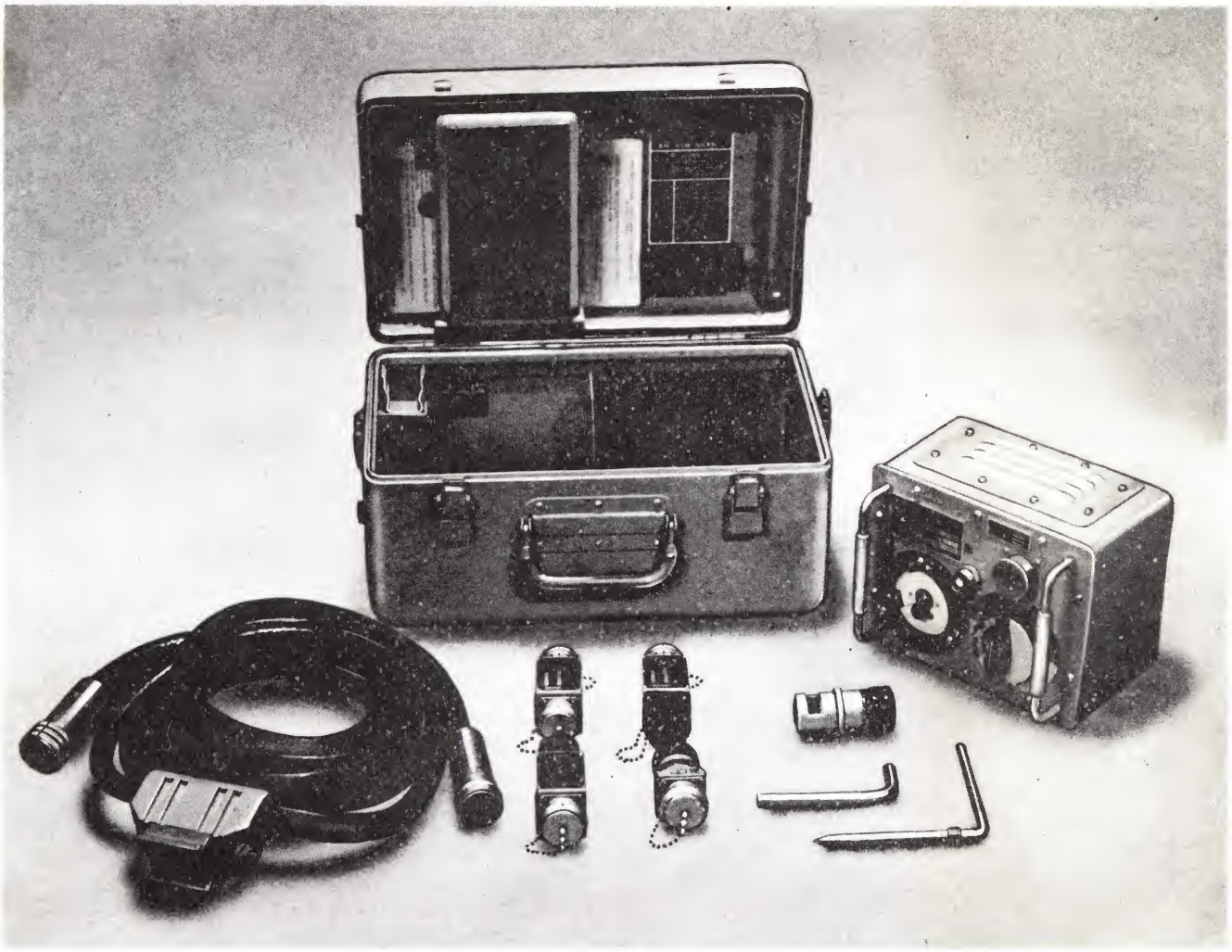


Figure 6-2. Guided Missile Launcher Test Set AN/ASM-20.

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